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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER

TRAN, NHAN T

ART UNIT	PAPER NUMBER
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2615

DATE MAILED: 12/15/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/410,800	ACHARYA ET AL.	
	Examiner	Art Unit	
	Nhan T. Tran	2615	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 27 August 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,3-20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1, 3-20 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 8/27/2004 has been entered.

Response to Arguments

2. Applicant's arguments, see amendment, filed 8/27/2004, with respect to claims 1, 3-6, 11, 12, 16-20 rejected as being anticipated by Maenaka et al (US 5,552,827) have been fully considered and are persuasive. The rejection of these claims is withdrawn.

Applicant's arguments for rejected claims 1, 13, 16 and 19 as being anticipated by Hamilton, Jr. et al (US 5,629,734) have been fully considered but they are not persuasive.

Regarding independent claims 1, 13, 16 and 19, on page 9 of the remarks, the Applicant asserts that Hamilton fails to teach or suggest "computing a color signal includes relatively weighing the pixel signal values by relatively weighing more heavily the pixel signal values associated with the direction increasing less relatively in pixel signal value level for the particular pixel location." In response, the Examiner respectfully disagrees. As clearly seen in col. 5, lines 25 – col. 6, line 5, the missing green color G5 at location A5 is computed as being $G5 = G5H$ if relative change in horizontal direction DH is smaller than relative change in vertical

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direction DV ($DH < DV$), meaning that horizontal correlation is stronger than vertical correlation. In this view, the missing G5 is computed by relatively weighing more heavily the pixel values associated with the horizontal direction (G4, G6 and A3, A5, A7) with weighing coefficient being $\frac{1}{2} = 0.5$, $\frac{1}{4} = 0.25$ as shown in col. 5, line 51 while weighing coefficient in vertical direction is **zero**.

In view of the above, Hamilton meets the limitations of claims 1, 13, 16 and 19.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 3-12 are rejected under 35 U.S.C. 112, second paragraph because the dependencies of these claims are unclear. Claims 3-12 directly or indirectly depend to the cancelled claim 2.

The following art rejection is applied to claims 3-12 as best understood in view of the 112 second paragraph rejection above. The Examiner assumes that claim 3 depends to claim 1, and the dependencies of claims 4-12 are in the order as presented.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

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A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 1, 3-6, 13-20 are rejected under 35 U.S.C. 102(b) as being anticipated by Hamilton, Jr. et al (US 5,629,734).

Regarding claim 1, Hamilton discloses a method of interpolating color pixel signals from a subsampled color image comprising:

for a particular pixel location (A5) in the subsampled image, comparing relative changes in a particular color pixel signal level for two mutually orthogonal directions (horizontal and vertical directions) across the particular pixel location using pixel signals values (i.e., G2, G4, G6, G8...) immediately adjacent to the particular pixel location (see Fig. 3; col. 4, lines 34-53 and col. 5, lines 25-50);

computing a color signal value (missing G5) for that particular pixel location for a color plane (color plane of A5 which is either blue or red color plane) other than the color plane of the pixel signal value in the subsampled color image at that location by relatively weighing the pixel signal values (multiplying the pixel values by $\frac{1}{2} = 0.5$, or $\frac{1}{4} = 0.25$), the relative weights depending, at least in part, on the relative change of pixel signal value in a particular direction;

wherein computing signal a color signal includes relatively weighing the pixel signal values by relatively weighing more heavily the pixel signal values associated with the direction (i.e., horizontal direction) increasing less relatively in pixel signal value level for the particular pixel location. See col. 5, line 25 – col. 6, line 5, wherein the missing G5 is computed by relatively weighing more heavily the pixel values associated with the horizontal direction (G4,

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G6 and A3, A5, A7) with weighing coefficients being $\frac{1}{2} = 0.5$, $\frac{1}{4} = 0.25$ as shown in col. 5, line 51 while weighing coefficient in vertical direction is **zero**.

Regarding claim 3, it is clear that the subsampled image comprises an image in RGB color space format (see whole reference).

Regarding claim 4, the subsampled color image comprises Bayer pattern (col. 1, line 45 and col. 2, lines 56-63).

Regarding claim 5, it is also clear that the color plane of the pixel signal value (A_x) at the particular pixel comprises the R color plane (see col. 5, lines 25-40, wherein A_x is either red or blue color) and the two mutually orthogonal directions comprising the horizontal and vertical directions, the particular color plane for the color signal value (G_5) being computed comprises the G plane; and the particular color for the pixel signal value levels being compared comprises G (i.e., $|G_4 - G_6|$ and $|G_2 - G_8|$ as shown in col. 5, lines 40-50).

Regarding claim 6, see the analysis of claim 5, and note for A_x being blue color plane.

Regarding claim 13, see the analysis of claim 1. Additionally, a storage medium, having stored thereon instructions to be executed by a system for interpolation of color pixel values from a subsampled image is inherent in Hamilton in order for the system to function as demonstrated by Figs. 3 & 5, col. 3, lines 20-24 that shows software instructions.

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Regarding claims 14 & 15, see the analyses of claims 3 & 4, respectively.

Regarding claim 16, see the analysis of claim 1, wherein the integrated circuit is indicated by digital signal processor 22 in Fig. 1, col. 3, lines 20-24.

Regarding claims 17 & 18, see the analyses of claims 3 & 4, respectively.

Regarding claim 19, see the analysis of claim 1, wherein a computing platform is represented by the circuitry shown in Fig. 1.

Regarding claim 20, see the analysis of claim 3.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 7-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hamilton, Jr. et al (US 5,629,734) in view of Cok (US 4,642,678).

Regarding claim 7, Hamilton discloses that red and blue interpolation are processed based on the classifiers in two diagonal directions (DN and DP) as described in col. 4, line 61 – col. 5, line 6. However, Hamilton fails to teach that the particular color for the pixel value level being compared comprises B hue.

As taught by Cok, interpolation processing circuit comprises red and blue hue component producing means (to produce HR and HB) for use in red and blue interpolation process so that color fringes are reduced in areas of image detail without introducing hue shifts in these areas to smoothly produce hue changes from one sampling location to the next (see col. 4, lines 12-20 and col. 5, lines 20-50).

Therefore, it would have been obvious to one of ordinary skill in the art to improve the interpolation process in Hamilton by including blue hue components in the comparison of classifiers in two diagonal directions for interpolation of B signal value at R pixel location so as to reduce color fringes in areas of image detail without introducing hue shifts in these areas.

Regarding claim 9, see the analysis of claim 7, wherein the interpolation of R signal value at B pixel location is implemented in the same manner.

Regarding claims 11 & 12, Cok also discloses in Fig. 6 and col. 6, line 62 – col. 7, line 45 that missing R or B at G pixel location is computed in two vertical and horizontal directions, the particular color plane for the color signal value being computed respectively comprising R or B plane, and the particular color for the pixel signal value level being comparing respectively comprising R or B hue.

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Regarding claims 8 & 10, see the analysis of claims 11 & 12, and note that the disclosure in Cok, col. 6, line 62 – col. 7, line 45 encompasses the limitations of each of the claims 8 & 10.

Conclusion

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Nhan T. Tran whose telephone number is (703) 605-4246. The examiner can normally be reached on Monday - Thursday, 8:00am - 6:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Andrew B Christensen can be reached on (703) 308-9644. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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